ROLLING THUNDER, ANALYTICS, AND PERFORMANCE DRIVE *NEED FOR SPEED* WORLD*

NEW ONLINE RACING GAME JUMPS QUICKLY TO THREE MILLION PLAYERS

Need for Speed World*, built by Electronic Arts (EA) Black Box in Burnaby, British Columbia, started a little more than two years ago with a simple idea: become the first real racing MMO. Racing games developed earlier in the MMO era have tended to appeal to only true car enthusiasts. But EA wanted to take the car culture to a more casual audience, knowing that racing gamers don't need to understand the ins and outs of how a car works in order to enjoy zipping along online city streets or a race circuit at high speed.

This free-to-play, graphically-rich online game has over three million players; is continuously refreshed with new features, modes, cars, and an expanding world; and is already optimized for play on the 2nd Generation Intel® Core™ i5 processors. Whether you drive a laptop or a desktop, massively multi-player racing has never felt so good. To get in on the racing action, download the game for free at: http://world.needforspeed.com/.

Visual Adrenaline recently caught up with two of the key visionaries behind *Need for Speed World* and got a glimpse behind the scenes. Dave Wall, a 15-year veteran of the gaming industry, is the rendering and systems lead and has been working for more than three years on the *Need for Speed* franchise for EA. Eneko Bilbao, Black Box's technical director, is a long-time technical strategist for racing games in Europe and has worked on *Need for Speed* for two years. Together, Wall and Bilbao provide a convincing case for using Agile development, in-game analytics, and Intel® tools for creating a rolling-thunder rollout of new game features and optimized game performance.

The Development Team Goes Agile

Before its MMO incarnation, *Need for Speed* was released every year by Black Box from its offices in Vancouver, B.C. Because such a pace was unsustainable, execs decided to share the NFS franchise across multiple studios. Gone were the lengthy periods of intense crunch time to get the game released every year. Also, the team switched to an Agile development process and started churning out smaller, more frequent updates. "Now we're releasing a patch every week," Wall explained. "The way we used to do games just isn't sustainable for this type of game, so it's been something we had to change."

Pivoting from the old days of long projects with a big push at the end by all the team members just prior to code release, the culture of the development team is now about learning and reacting quickly. The team has replaced brute force and long hours with being very smart and quick to react to challenges faced by their players. "Because we are creating a game as a service, we have been extremely careful to manage overtime—and actually try not to have any—because the game is never stopping. Today we work at a level pace, which not only is better for our developers, but allows us to constantly improve the game for our players," said Wall.

With today's weekly maintenance routine, *Need for Speed World* is rolling out live patches and feature updates like a well-oiled machine. Some of the recently released features include new car models, car customization, and a completely new night time mode, where all the cars are lit with headlights and new special effects. What's in the hopper for the future? That's where the developers' use of in-game analytics comes to bear.

In-Game Analytics Substantiate Player Feedback

Need for Speed World uses a proprietary suite of in-game analytics that pinpoint exactly what the players are doing in the game at any given moment. The developers can analyze what the gamers seem to enjoy and use that data to speed adoption of new features and modes. These analytics allow the development team to almost instantly gain "telemetry" on how the gamers are using a new feature and the rate at which it is being adopted.

"Initially," said Bilbao, "we didn't know exactly what data we were after—so we captured maybe too much data. But now we are optimizing it to make sure we get what's relevant."

"When we release a new racing circuit, or a new area in the city, we can track whether the gamers are using the circuit or going to that new area," Wall noted. "We can see if they are having difficulties and get a lot of immediate feedback on what's happening there. Not everything we release is immediately adopted by our gamers; we've seen some features or gameplay that the players aren't happy with just by reviewing our analytics." When that happens, the team can decide whether they need to change anything or whether they need to spend their resources on a new feature that's already in the pipeline, but scheduled farther in the future.

Having instant access to such a treasure trove of information is a developer's dream. The game's pricing model is based on the levels being free, but after that, everything is microtransaction-based. The analytics help the game developers understand what people are buying, why they are buying it, what they were doing before their purchase, and much more.

EA's Bilbao said they consider a lot of data points, with analytics being just one facet of their decision making. "In addition to our analytics, we look at the forums, and then we take that feedback and adapt. We listen to what the community really wants, so that's why we are in this very different space from any

other game. We see what really matters, whether it's really verbalized and expressed or just brought out by data patterns from our analytics. We see how the customers enjoy playing this mode more than the other one, enjoy this race, enjoy this car, and so forth. Then we can quickly respond using our Agile development process."

Wall agreed. "We've got all licensed car models, which is a big thing for a lot of people. Each player wants to race his or her dream car." Developers found that players wanted to customize their rides, add vinyls and stickers, and then show off their work. Based on player feedback and analytics, developers also realized that even though they were producing a racing game, racers needed a place to cruise along, parade-style. So they added a photo mode, an area of the game where players don't have to race around—they can drive their car and get screenshots to share with fellow racers and friends.

The payoff has been a rise in customer satisfaction and rapid growth, even though the team is sticking closely to their original goals. "We want to be THE racing MMO," Bilbao said. "We want to be the top game for the casual, mass-market car audience." New, rich content continues to pour out of the studio. Around the time this article goes to press, a new game mode, Team Escape, will debut, opening up the complex racing action even more with a cooperative pursuit mode. And a new night time driving mode will make an appearance, showcasing additional rendering and lighting effects. And of course—the cars: more licensed cars will come online at a regular pace. The development team is also looking into 3D, alternate platforms, wide-screen settings, and new power-ups. With all those customer requests, it's good to have rock-solid data to support their decisions.

Optimized to Perform Across the PC Spectrum

The expectations are set high for the game in terms of graphics because the team actually compares themselves to the other *Need for Speed* titles. "So the bar is really high," Wall admitted. "When we look at what we are trying to achieve, when we look at the visuals, the art and game reviews are all done on high-end hardware with all the effects turned on. The challenge has been to build something scalable that still looks good when you are in medium settings."

Because the game runs on a wide range of hardware that dates back more than five years, much of the development work has focused on scalability, supporting what are essentially primitive machines all the way up to Intel® Core™ i7 processors.

"From the beginning," Bilbao said, "we were focused on the low-end machines because we wanted to make sure that it runs on business-class laptops. Initially the game was designed for

ANALYTICS HELP TUNE *NEED FOR SPEED* WORLD*

A common problem in the gaming world is the need to balance out changes, updates, and added features with the fear that the game's players may not care. Before investing huge sums of money and developer time, producers have to be confident that the work will pay off. One way to make sure is to gather extensive amounts of data from the game itself. *Need for Speed* World* produces mountains of data about the game and the way it is played in the real world, and that data stream has proven to be a wealth of information. Eneko Bilbao, EA's technical director, took some time to describe the analytics that monitor the gameplay and area usage, giving live feedback to the development team.

"The whole system is custom-built," Bilbao explained, "around established technology like Microsoft SQL Server* Integration Services and MicroStrategy* 9, allowing for the vast volume of data we need to process. We hired experts from the retail and finance industries to help us architect and build the analytics system end-to-end."

Although EA already has systems in place for gathering traditional web metrics and usage statistics, the added system takes that information flow to a new level. "We are fully compatible and integrated with the existing system," Bilbao said. "But the new analytics system was built specifically for *Need for Speed World*, as the team needed something sophisticated and scalable to deal with the volume of data coming in."

"We actually use it to tune the game," Bilbao added. "As in most MMOs, balancing the different items, skills, and events is crucial to offer a fair and fun experience. By looking at aggregated data, we see which events are the most popular and then try to understand what they have in common to drive the design of new races. Also, by looking at which cars are currently hot with our gamers, we can see which ones we should bring out next or if we need to retune some to make them on par with the other cars in the game."

"Drinking from the firehose" is a common metaphor that sums up what it's like to try to understand an overwhelming amount of data coming in quickly and continually. Bilbao is trying to sip from a shot glass instead. "Our servers process one million records per hour, which is around 8 GB of data to process daily. On modern hardware, it takes around eight hours to process and to generate all the reports we need."

The payoff for analyzing all that data is instant access to what the gamers like and want more of in the game. And that's a developer's dream. ■

the Asian market, where they have an Internet café and not necessarily the high-end computers. We want to offer the best experience ever on this class of hardware, so we zeroed in on integrated graphics, laptops, and the business machine."

Interestingly, however, the team develops and tests the game across a wide spectrum of PCs, including the new 2nd Generation Intel® Core™ i7 processor systems, with four or eight gigabytes of RAM and running 64-bit Microsoft Windows* 7, as well as a variety of older machines, laptops, and even high-end netbooks.

Intel Tools Make a Difference

Getting that optimization correct across so many hardware possibilities would not have been easy without the help of Intel's tools, including the Intel® Graphics Performance Analyzers (Intel® GPA) and Intel® VTune™ Performance Analyzer. For example, Wall noted that, "The Intel GPA tool helps us to understand what is expensive on the low-end that is going to be reserved only for high-end. I think that is where it really comes in handy—understanding the different characteristics of the hardware." The team put in a lot of work to identify and understand which effect to assign to which class of processor and then make sure that the game is perfectly balanced, depending on what it is running on. "Intel GPA is very good at telling us how long a particular effect took in terms of GPU time," Wall explained. "That makes it easy to know exactly which effects to shut down to try and get the frame rate as high as possible.

"Intel GPA is fantastic in being able to drill down and see exactly what was done through to the hardware, allowing us to detect and locate edge cases where the game could be optimized," Wall continued. For example, by extensively using captures with Intel GPA, they were able to visualize and resolve cases where the engine was spending rendering time on surfaces or menu targets that weren't visible to the user.

Thanks to the use of Intel® optimization tools, the work the development team did for current PCs easily translates to the 2nd Generation Intel Core processors. Wall said the work has already paid off. "We were pleasantly surprised when we got our first 2nd Generation Intel Core processor machines. Using [Intel] VTune [Performance Analyzer], we identified an entire section of the multi-player code that we could move to another thread. Once we did that, on our 2nd Generation Intel Core processor systems we're basically GPU bound, especially on high settings. We're pretty happy running at 60 FPS on medium settings, but we're trying to get ita bit better on high settings. We see that we need to spend a bit of time optimizing on the GPU."

So even though the 2nd Generation Intel Core i5 and Core i7 processors systems weren't on store shelves when this article was written, *Need for Speed World* will support them on Day 1. That's one way to win a race—take the checkered flag before the starting pistol is even fired. ■

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